REMARKS

This paper responds to the office action mailed February 6, 2004 ("the office action"). Claims 1, 3, 9, 11, 12 and 15 have been amended, claim 2 has been cancelled, and claims 20-22have been added herein. Hence, claims 1 and 3-22 are currently pending. Applicants respectfully request reconsideration of the present application in light of the following remarks.

Drawings

Section 2 of the office action objected to the drawings for allegedly failing to show each feature specified in the claims. Specifically, the office action stated, "the battery temperature sensor, the integrator must be shown...."

Applicants respectfully submit, however, that these claim elements are properly illustrated. The block diagram shown in Figure 7 includes the VIT board 20, which receives inputs from a plurality of temperature sensors 41. Figure 17B illustrates a proportional-integral (PI) control loop including a PI controller (labeled "PI"), which includes a proportional element (P) and integrator element (I).

Applicants therefore believe that the objection to the drawings has been overcome.

Specification

Section 3 of the office action requested Applicants' cooperation in correcting errors in the specification. If any errors are discovered, Applicants will provide amendments to correct such errors.

Citing 37 CFR 1.75(d)(1), section 4 of the office action objected to the specification for allegedly failing to provide "antecedent basis for the claimed subject matter." Rule 1.75(d)(1)

merely requires the meaning of the terms in the claims may be ascertainable by reference to the description. The specific phrases addressed in the office action are addressed in turn below.

Battery temperature—

Claim 18 includes the step of setting the voltage setpoint as a function of battery temperature. First, setting a control loop setpoint as based on batter temperature seems entirely clear on its face. The office action states that the specification "mentions only once that 'voltage setpoint may be selected as a function of battery temperature.'" The office action quoted this passage from the summary section of the present specification. However, this is not the only mention of temperature compensation for battery charging. For example, the specification at page 41 describes battery charging, and more specifically, temperature compensated battery charging.

Applicants thus believe that the meaning of "battery temperature" is entirely ascertainable.

Pre-loading the integrator—

Claim 12 has been amended to remove this phrase.

Particular charging current—

Claim 15 has been amended to remove this phrase.

Voltage setpoint initial and final values, and zero charging current—

The meanings of these terms is described, for example, beginning at line 21 of page 38, which describes varying the voltage setpoint to maintain a desired battery charging current.

As the phrases objected to in the office action have either been deleted, or have support in the specification as referenced above, the objections to the specification are believed to be overcome.

Claim Rejections – 35 USC § 112

Section 6 of the office action rejected claims 9 and 11-14 under 35 USC 112, second paragraph, as allegedly being indefinite. Each of the 35 USC 112 rejections is addressed as follows:

Claim 9 has been amended to eliminate the term "thereby".

Claim 11 has been amended to remove the reference to "rectifier firing angle."

In rejecting claim 14, the passage of the specification quoted in the office action is discussing battery charging. The rectifier startup process is described, for example, beginning at page 25 of the specification, including varying the setpoint.

Claim 15 has been amended to remove the term "particular."

Applicants thus believe each of the section 112 rejections has been overcome.

Claim Rejections – 35 USC § 102

Sections 7-8 of the office action rejected claims 1 and 2 under 35 USC 102(b) as allegedly being anticipated by "Design and Implementation of a Multiprocessor-based Uninterruptible Power Supply," Tzou Y. Y. et al. ("Tzou"). Applicants respectfully traverse these rejections.

Claim 1 has been amended to incorporate the subject matter of claim 2, and claim 2 has been canceled. Regarding claim 2, the office action states, "it is an inherent function of the Digital UPS Controller and the three microprocessors, which are part of it, to share a common global memory...." The office action does not identify a specific disclosure of three microprocessors sharing a common memory, but alleges that this would somehow be inherent.

However, Tzou paper explicitly shows the system processor sharing a dual port memory with the rectifier and sharing a *separate* dual port memory with the inverter. There is no direct link between the rectifier and inverter. There is no teaching or suggestion in Tzou of three processors sharing the same memory. The shared common memory arrangement recited in claim 1 is advantageous over Tzou's scheme, since all three microprocessors can communicate directly with each other. In Tzou's implementation, the inverter control processor and the rectifier control processor can only communicate by passing data through the third system processor which extends data access time and requires more processor instructions. The claimed scheme enhances the overall system processing capacity.

Applicants therefore respectfully submit that claim 1 is patentable over Tzou.

Claim Rejections – 35 USC § 103

Sections 9-14 of the office action rejected claims 3, 5, 6, 9 and 10 under 35 USC 103(a) as allegedly being unpatentable over various references. These claims all ultimately depend from claim 1, which is allowable as set forth above. For at least this reason, claims 3, 5, 6, 9 and 10 are also allowable.

Section 15 of the office action rejected claims 11, 13 and 15-17 under 35 USC 103(a) as allegedly being unpatentable over "An UPS With Proper Crest Factor and Efficiency For Computer Loads," El-Bakry M.A. et al. ("El Bakry") in view of U.S. Patent No. 5,920,189 to Fisher et al. ("Fisher"). Applicants respectfully traverse these rejections.

It is well accepted that, to establish a *prima facie* case of obviousness, there must be a motivation to combine the cited references, and each of the claim limitations must be disclosed in the cited references. Applicants to not believe there is a motivation to combine the teachings

of El Bakry and Fisher, and further, the combination of these references fails to disclose each recited claim limitation.

The cited portions of El Bakry do not mention a rectifier control. El-Bakry appears to address which type of UPS output waveform (squarewave, sinusoidal, etc. is best, efficiency-wise, for computer loads). As El Bakry is not concerned with rectifier control, there is no motivation for one skilled in the art to attempt to combine its disclosure with Fisher to obtain the claimed method.

Fisher is directed to a measurement circuit only, not a controller: "An improved current monitor for measuring current over a wide dynamic range." Fisher at abstract. Claim 11 is directed to a control method. In the method of claim 11, the rectifier controller normally controls the voltage of a DC bus. Accordingly, the DC bus voltage is sensed and compared to a setpoint voltage, and the firing signal timing is adjusted to minimize the error. Further, the controller has the capability to switch to other modes of operation depending on reaching a limit of rectifier input or battery charging currents. Thus, the method steps further include

> "determining whether an input current of the rectifier or a charging current of the battery is above a predetermined limit; and
> switching control to a different control loop to maintain the input current or the charging current within the predetermined limit."

As admitted in the office action, Fisher merely discloses "the control system selects as its input the output of the first amplifier when the battery is discharging and the output of the second amplifier when the battery is charging." Office action at 9-10. There is no teaching or suggestion in the cited passages of Fisher of switching to different control modes in response to an input current of the rectifier or the charging current of a battery.

Applicants therefore respectfully submit that claim 11, and claims 13 and 15-17 which are dependent thereon, are patentable over the combination of El Bakry and Fisher.

Section 16 of the office action rejected claim 18 under 35 USC 103(a). Claim 18 ultimately depends from claim 11, which as set forth above, is believed to be allowable. For at least the same reasons, claim 18 is also believed to be in condition for allowance.

Section 17 of the office action rejected claim 19 under 35 USC 103(a) as allegedly being unpatentable over "A Control Method for High Power UPSs in Parallel Operation," Martins, A.P. et al. ("Martins") in view of "Discrete Feedforward Sliding Mode Control of a PWM Inverter for Sinusoidal Output Waveform Synthesis," Shi-Liang Jung et al. ("Jung"). Applicants respectfully traverse this rejection.

Martins paper discloses a simplified control method for a plurality of inverters having similar characteristics using "only the voltage control loop and using a common phase reference for all the inverters." Martins at 209. The office action states that Martins discloses adjusting a phase angle of a voltage generated by each uninterruptible power supply to eliminate real power unbalances among the plurality of uninterruptible power supplies and adjusting a magnitude of a voltage generated by each uninterruptible power supply to eliminate reactive power unbalances among the plurality of uninterruptible power supplies, but fails to provide specific passages of Martins disclosing these elements. The office action merely cites the entire Martins article.

The office action goes on to state that Jung shifting a location of a harmonic servo compensator pole to reduce the bandwidth of the controller for each harmonic. Again, no specific passages of Jung are cited in support of this allegation, the entire article is simply cited.

According to its abstract, Jung discloses the use of a feedforward sliding mode control (SMC) scheme for a PWM inverter. A result of the proposed control scheme is low total harmonic distortion. However, Jung does not appear to disclose reducing the bandwidth of harmonic servo compensator poles as a means of sharing harmonic load in UPSs.

Therefore, the combination of Martins and Jung fails to disclose each claim limitation and, as such, claim 19 is allowable over the combination of these references.

New claims

New claims 20 and 21 have been added herein. Claim 20 includes the subject matter of original claims 1 and 4. As claim 4 was identified as having allowable subject matter, claim 20 is believed proper for allowance. Claim 21 combines the subject matter of original claims 1, 6 and 7. Similarly, claim 22 combines the subject matter of original claims 1, 6 and 8. As claims 7 and 8 were also identified as containing allowable subject matter, new claims 21 and 22 are believed to be proper for allowance.

Conclusion

As evidenced by the foregoing amendments and remarks, Applicants have made a genuine effort to address each issue raised in the office action. All of the pending claims are believed to be in condition for allowance. The Examiner is invited to contact the undersigned attorney at 952.474.3701 with any questions, comments or suggestions relating to the referenced patent application.

Respectfully submitted,

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